

Butterflies and moths (Insecta: Lepidoptera) associated with *erva-mate*, the South American Holly (*Ilex paraguariensis* St. Hil.), in Rio Grande do Sul, Brazil

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ABSTRACT: The result of an inventory on the lepidopteran fauna associated with the South American Holly (*erva-mate*) is described. This inventory was based on a bibliographic review, the examination of specimens deposited in scientific collections from the state of Rio Grande do Sul, the systematic collection within commercial *erva-mate* farms located in Anta Gorda, RS, and on the occasional collections from native trees within the Região dos Vinhedos campus of the Universidade de Caxias do Sul. Every fifteen days between 20 August 2005 and 19 August 2006, 150 trees were visually inspected and all Lepidoptera were collected. A list of 75 lepidopteran taxa belonging to 16 families is presented, including 27 new occurrences for the *erva-mate* crop, of which 14 species represent new records for the state.

INTRODUCTION

Among the plants explored in the southern region of Brazil, the *erva-mate* (*Ilex paraguariensis* – Aquifoliaceae, South American Holly) is a very evident crop with significant socioeconomic, environmental and cultural importance that forms one of the most characteristic agro-forestry systems (Bozzetto 1995; Tormen 1995). As a tree that is naturally ombrophilous, it becomes predisposed to pest attacks after being subjected to physiological stress, when cultivated in open areas, and especially as a monoculture (Carpanezzi 1995; Borges *et al.* 2003). The simplification of the ecosystem to a monoculture tends to generate impacts that favor some phytophagous insect species. The observed incidence of pests is less abundant in natural *erva-mate* stands that include other forest species (Borges *et al.* 2003).

Almost one hundred phytophagous insects are associated with *erva-mate* plants, especially among the Lepidoptera and Coleoptera (Diaz 1997). With respect to Lepidoptera, species which harm *erva-mate* plants have been mentioned since the beginning of the last century (Jorgensen 1921; Ronna 1934; Parseval 1937; Bourquin 1944). The number of harmful species has increased over time, where, Penteado (1995) listed 20, Azevedo and Corseuil (1996) 30, and Diaz (1997) 41 lepidopteran taxa. This increasing tendency in the number of associated species is mainly due to most previous research only recording species with large economic impact, namely *Hedypathes betulinus* (Coleoptera: Cerambycidae) (d'Avila *et al.* 2006) and *Gyropsylla spegazziniana* (Hemiptera: Psyllidae) (Chiaradia *et al.* 2002), and the failure to consider the ecosystem as a whole. Most Lepidoptera occur at low population levels, without causing expressive economic damage to the *erva-mate* crop, resulting in very

restricted knowledge of their species diversity, biology, and population dynamics. Nevertheless, together, these insects can limit production, making periodical monitoring fundamental, considering that ecological imbalances, including those occurring due to the monoculture itself, can elevate one or more species to pest condition (Penteado 1995).

Given that specific knowledge can provide grounds for alternative cultural management and, at the same time, contribute to the knowledge of the insect fauna associated with regional native plants, the objective of this study is to contribute an updated list of the Lepidoptera associated with the *erva-mate* plant.

MATERIALS AND METHODS

The inventory data of the Lepidoptera associated to the *erva-mate* crop was obtained from a bibliographic review, from the examination of specimens deposited in scientific collections within the state of Rio Grande do Sul (RS), from the systematic collection within commercial *erva-mate* crops, and from occasional collecting.

The bibliographic research encompassed all literature on the *erva-mate* plant, from Brazil, Paraguay, Argentina and Uruguay, registering the first author to record a specific Lepidoptera species on the crop. The records with only generic level information were considered when associated specimens were present in collections.

Specimen examination included those from scientific collections of the following institutions: the Museu de Ciências e Tecnologia of the Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre (MCTP); the Museu Ramiro Gomes Costa, Fundação Estadual de Pesquisa Agropecuária, Porto Alegre (MRGC); the Museu Anchieta de Ciências Naturais, Porto Alegre (MAPA); the

Museu de Ciências Naturais of the Fundação Zoobotânica do Rio Grande do Sul, Porto Alegre (MCNZ); the Museu Entomológico Ceslau Biezanko, Faculdade de Agronomia Eliseu Maciel, Universidade Federal de Pelotas, Pelotas (MECB); the Coleção Andrej Menchoy Bertels of the Centro de Pesquisa Agropecuária de Clima Temperado, EMBRAPA, Pelotas (CAMB); the Museu de Ciências Naturais, Universidade Católica de Pelotas, Pelotas (MUCP); the Setor de Entomologia, Faculdade de Agronomia da Universidade Federal do Rio Grande do Sul, Porto Alegre (FASE); and the collection of the Laboratório de Biologia do Departamento de Ciências Exatas e da Natureza of the Universidade de Caxias do Sul (CUCS).

The systematic collecting occurred every fifteen days, between 20 August, 2005 and 19 August, 2006, for a total of 27 collections, in the municipality of Anta Gorda, of the Encosta Inferior do Nordeste region, state of RS. Three commercial *erva-mate* farms with a minimum regrowth of one year and without the use of insecticides were selected and fifty randomly chosen trees were visually examined in each farm. The study areas are located within a quadrilateral between the coordinates 28°56'40" S, 52°01'12" W; 28°57'11" S, 52°01'13" W; 28°56'56" S, 52°00'56" W and 28°56'44" S, 52°01'00" W.

The occasional collecting occurred on several native *erva-mate* plants found in Bento Gonçalves, within the Região dos Vinhedos campus of the Universidade de Caxias do Sul, CARVI-UCS, from which leaves were removed for the feeding of reared larvae.

After collection, larvae were reared in the CARVI Laboratório de Biologia, under a temperature of 25 ± 1°C, RH 70 ± 10%, with a 14 hour photophase, and fed with *erva-mate* leaves. Upon emergence, adults were spread and dried and eventually incorporated in the CUCS and MCTP collections as voucher material. The specimens were identified using specific bibliographic resources (e.g.

D'Abrera 1995; 1986; Kitching and Cadiou 2000; Willmott 2003; Lamas 2004) and sent to specialists when necessary.

The nomenclature was updated following Davis (1964) for Psychidae; Heppner (1995) for Dalceridae, Limacodidae, Megalopygidae and Tortricidae; Heppner (1996) for Apatelodidae, Lasiocampidae and Saturniidae; Kitching and Cadiou (2000) for Sphingidae; Lamas (2004), for Hesperidae, Nymphalidae and Riodinidae; Pogue (2002) for *Spodoptera*; Poole (1989) for the remaining Noctuidae; Scoble (1999) for Geometridae and Teston and Corseuil (2004) for Arctiinae.

RESULTS AND DISCUSSION

Table 1 lists the Lepidoptera in alphabetical order, by genus and species, also including the first bibliographical reference which cites the *erva-mate* as a host plant and the occurrence of the taxon in the state of Rio Grande do Sul. Additionally, when deposited material exists, the collection and/or field capture data is indicated.

A list of 75 lepidopteran taxa belonging to 16 families is presented, including 27 new occurrences for the *erva-mate* crop whose adults are shown in Figures 1-27. The number of lepidopteran taxa from published records, the specimens found in collections, and those obtained by collecting are presented in Figure 28.

A bibliographic review, with the updated nomenclature and the exclusion of Lepidoptera cited as "sp." when voucher material was not available, resulted in 48 taxa. During the systematic collecting in farms and/or occasional collections in CARVI-UCS, thirty seven Lepidoptera were obtained, including 26 new occurrences for the *erva-mate* crop, of which 15 species represent new records for the state of Rio Grande do Sul. Six other taxa were found after examining collections, of which two are new records for the *erva-mate* crop, although one was also found during collecting.

TABLE 1. Lepidoptera occurring on *erva-mate* plants, indicating the presence in the sampling (collecting in three commercial *erva-mate* farms within the municipality of Anta Gorda, between August 20, 2005 and August 19, 2006, and occasional samples), Museum and/or literature records, with first author to record the species for the crop and for the state of Rio Grande do Sul.
Number of individuals collected. * First records for the *erva-mate* crop. ** First records for the state of Rio Grande do Sul. Literature records: 1- Baucke 1960a; 2- Baucke 1960b; 3- Bertels and Bauke 1966; 4- Biezanko 1949; 5- Biezanko 1961; 6- Biezanko 1982; 7- Biezanko 1986; 8- Biezanko and Freitas 1938; 9- Biezanko *et al.* 1974; 10- Bourquin 1943; 11- Bourquin 1944; 12- Bouvier 1930; 13- Corseuil *et al.* 2002; 14- De coll and Saini 1992; 15- Hayward 1969; 16- Iede and Machado 1989; 17- Jorgensen 1921; 18- Jorgensen 1932; 19- Kober and Vargas 1960; 20- Koehler 1934; 21- Koehler 1935; 22- Lima 1947; 23- Mabilde 1896; 24- Mattos 1982; 25- Muelo 1946; 26- Oliveira *et al.* 1999; 27- Parseval 1937; 28- Pastrana 2004; 29- Ronna 1923; 30- Ronna 1933; 31- Ronna 1934; 32- Silva *et al.* 1968; 33- Specht and Corseuil 1996; 34- Specht *et al.* 2005; 35- Teston and Corseuil 2004; 36- Trujillo 1995; 37- Weimer 1894; 38- Weimer 1907.

SPECIES	FAMILY	SAMPLING #	MUSEUM RECORDS	LITERATURE RECORDS	
				MATE	RS
<i>Acharia barbara</i> (Dyar, 1905)	Limacodidae			1	
<i>Acharia nesea</i> (Stoll, 1780)	Limacodidae			5	30
<i>Acharia trimacula</i> (Sepp, [1848])	Limacodidae			5	23
<i>Acraga moorei</i> Dyar, 1898	Dalceridae: Acraginae			14	
<i>Adelpha calliphane</i> Fruhstorfer, 1915	Nymphalidae: Limenitidinae			15	32
<i>Adelpha hyas hyas</i> (Doyère, [1840])	Nymphalidae: Limenitidinae	30		32	2
<i>Adelpha serpa serpa</i> (Boisduval, 1836)	Nymphalidae: Limenitidinae			3	3
<i>Adelpha thessalia indefecta</i> Fruhstorfer, 1913	Nymphalidae: Limenitidinae	172		17	4
<i>Adelpha thoasa gerona</i> (Hewitson, 1867)	Nymphalidae: Limenitidinae			15	
<i>Adelpha zea</i> (Hewitson, 1850)	Nymphalidae: Limenitidinae			9	4
<i>Alabama argillacea</i> (Hubner, 1823)	Noctuidae: Calpinae			31	31

TABLE 1. CONTINUED.

SPECIES	FAMILY	SAMPLING #	MUSEUM RECORDS	LITERATURE RECORDS	
				MATE	RS
<i>Apatelodes martia</i> (Stoll, 1782)	Apatelodidae: Apatelodinae			9	7
<i>Apatelodes tropea</i> (Schaus, 1896)	Apatelodidae: Apatelodinae			9	
<i>Argyrotaenia fletcheriella</i> (Köhler, 1939)	Tortricidae: Tortricinae			28	
<i>Argyrotaenia sphaleropa</i> (Meyrick, 1909)	Tortricidae: Tortricinae			14	5
<i>Astraptus fulgerator fulgerator</i> (Walch, 1775)	Hesperidae: Pyrginae			17	32
<i>Automeris illustris</i> (Walker, 1855)	Saturniidae: Hemileucinae	8		21	23
<i>Automeris naranja</i> Schaus, 1898	Saturniidae: Hemileucinae	18		10	38
<i>Bertholdia soror</i> Dyar, 1901	Noctuidae: Arctiinae	5		*	35
<i>Carales astur</i> (Cramer, 1777)	Noctuidae: Arctiinae	11		*	23
<i>Cerodirphia opis</i> (Schaus, 1892)	Saturniidae: Hemileucinae			34	12
<i>Citheronia brissotii brissotii</i> (Boisduval, 1868)	Saturniidae: Ceratocampinae	7		25	23
<i>Citheronia brissotii meridionalis</i> Bouvier, 1927	Saturniidae: Ceratocampinae			15	3
<i>Citheronia laocoon laocoon</i> (Cramer, 1777)	Saturniidae: Ceratocampinae			32	32
<i>Chalodeta theodora</i> (C. and R. Felder, 1862)	Riodinidae: Riodininae	1		*	23
<i>Dalcerina tijucana</i> (Schaus, 1892)	Dalceridae: Dalcerinae	1		24	5
<i>Dysschema sacrificia</i> (Hübner, [1831])	Noctuidae: Arctiinae	3		*	37
<i>Eacles imperialis magnifica</i> (Drury, 1773)	Saturniidae: Ceratocampinae	4		*	8
<i>Emesis mandana mandana</i> (Cramer, 1780)	Riodinidae: Riodininae			17	23
<i>Hylesia nigricans</i> (Berg, 1875)	Saturniidae: Hemileucinae	26		11	23
<i>Hylesia oratex</i> Dyar, 1913	Saturniidae: Hemileucinae			22	13
<i>Iridopsis aviceps</i> Prout, 1932	Geometridae: Ennominae	1		*	**
<i>Leucanella janeira</i> (Westwood, [1854])	Saturniidae: Hemileucinae			34	13
<i>Leucanella viridescens</i> (Walter, 1855)	Saturniidae: Hemileucinae			2	23
<i>Lophocampa citrina</i> (Sepp, [1843])	Noctuidae: Arctiinae			16	32
<i>Lumacra</i> sp.	Psychidae	5		*	**
<i>Manduca albiplaga</i> (Walker, 1856)	Sphingidae: Sphinginae			20	6
<i>Megalopyge urens</i> Berg, 1882	Megalopygidae	6		3	5
<i>Melanolophia</i> sp.	Geometridae: Ennominae	1		*	**
<i>Microgonia perfulvata</i> Dognin, 1916	Geometridae: Ennominae	1		*	**
<i>Nyceryx continua continua</i> Walker, 1856	Sphingidae: Macroglossinae	2	MRGC	*	26
<i>Oenoptila mixtata</i> Gueneé, [1858]	Geometridae: Ennominae	18		*	**
<i>Oxydia apidania</i> Cramer, [1779]	Geometridae: Ennominae			17	
<i>Oxydia distichata</i> Gueneé, [1858]	Geometridae: Ennominae			36	23
<i>Oxydia mundata</i> Guenee, [1858]	Geometridae: Ennominae			28	
<i>Oxydia sociata</i> Warren, 1895	Geometridae: Ennominae	2		*	**
<i>Oyketicus geyeri</i> (Berg, 1877)	Psychidae			27	30
<i>Oyketicus kirbyi</i> (Lands-Guilding, 1827)	Psychidae			27	29
<i>Paracles fusca</i> (Walker, 1856)	Noctuidae: Arctiinae	22		*	30
<i>Paracles variegata</i> (Schaus, 1896)	Noctuidae: Arctiinae	2		*	35
<i>Parasa cucumenica</i> Dyar, 1926	Limacodidae	1		*	**
<i>Pelochita cinerea</i> (Walker, 1855)	Noctuidae: Arctiinae	3		*	35
<i>Periga circumstans</i> Walker, 1855	Saturniidae: Hemileucinae	14		*	7
<i>Perigonia ilus</i> Boisduval, 1870	Sphingidae: Macroglossinae			17	
<i>Perigonia lusca lusca</i> (Fabricius, 1777)	Sphingidae: Macroglossinae			20	23
<i>Perigonia passerina</i> Boisduval, [1875]	Sphingidae: Macroglossinae	3		*	**
<i>Pherotesia subjecta</i> Warren, 1905	Geometridae: Ennominae	1		*	**
<i>Phobetron hipparchia</i> (Cramer, 1777)	Limacodidae	2		14	23
<i>Pleuroprucha asthenaria</i> Walker, 1861	Geometridae: Ennominae	1		*	**
<i>Polia marea</i> (Schaus, 1894)	Noctuidae: Hadeninae		MRGC	*	33

TABLE 1. CONTINUED.

SPECIES	FAMILY	SAMPLING #	MUSEUM RECORDS	LITERATURE RECORDS	
				MATE	RS
<i>Rothschildia aurota aurota</i> (Cramer, 1775)	Saturniidae: Saturniinae			17	23
<i>Rothschildia aurota speculifera</i> (Walker, 1855)	Saturniidae: Saturniinae	8		18	7
<i>Rothschildia jacobaeae</i> (Walker, 1855)	Saturniidae: Saturniinae			9	37
<i>Sabulodes</i> sp.	Geometridae: Ennominae	3		*	**
<i>Spodoptera cosmioides</i> (Walker, 1858	Noctuidae: Xyleninae	1		*	23
<i>Stenalcidia dukinfieldia</i> Schaus, 1897	Geometridae: Ennominae	1		*	**
<i>Stenoma armata</i> Zeller, 1877	Oecophoridae			28	
<i>Stenoma decora</i> Zeller, 1854	Oecophoridae			14	
<i>Tachuda pachydexius</i> Forbes, 1939	Notodontidae	1		*	**
<i>Talima</i> sp.	Limacodidae	1		*	**
<i>Thelosia camina</i> Schaus, 1896	Apatelodidae: Apatelodinae			19	19
<i>Thyrintheina arnobia arnobia</i> Stoll, 1782	Geometridae: Ennominae	2		9	**
<i>Titya proxima</i> (Burmeister, 1878)	Lasiocampidae: Macromphalinae	3		*	7
<i>Urbanus proteus proteus</i> (Linnaeus, 1758)	Hesperidae: Pyrginae			25	23
<i>Utethesia ornatrix</i> (Linnaeus, 1758)	Noctuidae: Arctiinae			28	37

In the current list, Geometridae was the family with the greatest increase in number of taxa, going from four to 13, which is reinforced by observations from local farmers who report an increase in the occurrence of “looper/ spanworm” caterpillars. Within this group, *Thyrintheina arnobia arnobia*, recorded in the *erva-mate* crop from Argentina (Chiarelli 1943; De Coll and Saini 1992; Trujillo 1995), and referred to as the eucalyptus pest in Brazil (Peres Filho and Berti Filho 2003; Holtz *et al.* 2003), presents its first distributional record for the state of Rio Grande do Sul.

Among the *Adelpha*, identified using Willmott (2003) and Lamas (2004), only *A. hyas hyas* and *A. thessalia indefecta* were recorded, already cited in the bibliography although under names considered synonyms. The records of *A. serpa hyas*, published by Bertels and Baucke 1966 and Azevedo and Corseuil 1996 and based on Mattos (1982) citing *A. hyas*, were eliminated as they have *A. serpa hyas* as a synonym.

The *erva-mate* caterpillar *Thelosia camina* (Kober and Vargas 1960), whose presence in crops had already been detected in 1931 and 1934 (Parseval 1937), was not found in collections nor was it collected during this study. This species is described in the literature as one of the main pests for this crop, due to the intensive damage it caused during past decades. However, the attack by larvae of this species has not been further recorded in the literature, although adults have been captured in light traps, reflected by recently deposited specimens in the MCTP (under numbers 15744 and 15745).

Saturniidae presented the highest number of taxa (Figure 29), with the collection of *Periga circumstans* representing a new record. The larvae with the highest defoliating potential are found within this group, be it due to the size of the specimens, which require a larger quantity of food for their development, or due to their gregarious behavior, observed mostly among the Hemileucinae, which can completely defoliate trees.

Furthermore, larvae belonging to this subfamily contain urticating hairs (Lemaire 2002) and can cause problems and inconveniences among laborers. The occurrence of *Leucanella janeira* and *Cerodirphia opis* was recently recorded (Specht *et al.* 2005), although the literature has two citations of *Cerodirphia* sp. by Iede and Machado (1989) and Penteado (1995).

Perigonia passerina, identified using the image in D’Abrera (1986) and the systematic proposal of Kitching and Cadiou (2000), and *Nyceryx continua continua*, both new records for the crop, were Sphingids collected during field activities. The taxa registered in the literature as *Pengonia lusca* F. forma *ilus* [sic] (Jorgensen 1921) and *Perigonia lusca ilus* (Muelo 1946) are herein considered as being *P. ilus*, following the systematic proposal of Kitching and Cadiou (2000). Likewise, *Perigonia lusca*, considered as one of the main pests of this crop in Argentina (De coll and Saini 1992; Trujillo 1995) and also registered in Paraná (Alves *et al.* 2001), is considered as being *P. lusca lusca*.

The Noctuidae, previously represented by three species, now has eleven, including the Arctiinae (*sensu* Lafontaine and Fibiger 2006). *Spodoptera cosmioides* is one of the new records among the Lepidoptera sampled during systematic collecting. Although the literature already has a citation of *Spodoptera* sp., by Diaz (1997), referring to Trujillo (1995), this taxon does not appear in the publication. This is possibly based on De Coll and Saini (1992), who present the image of a caterpillar of this genus which corresponds to the description of Zenker *et al.* (2007) for *S. cosmioides*. Another new record is of *Polia marea*, resulting from the examination of specimens in collections with an occurrence record for Rio Grande do Sul (Specht and Corseuil 1996).

Two families are included in the list: Lasiocampidae and Notodontidae, represented by the occurrence of *Titya proxima* and *Tachuda pachydexius*, respectively. Several other collected specimens are not included here because

the larvae, clearly different from the listed species, died due to pathogens and parasitoids, preventing the emergence of adults.

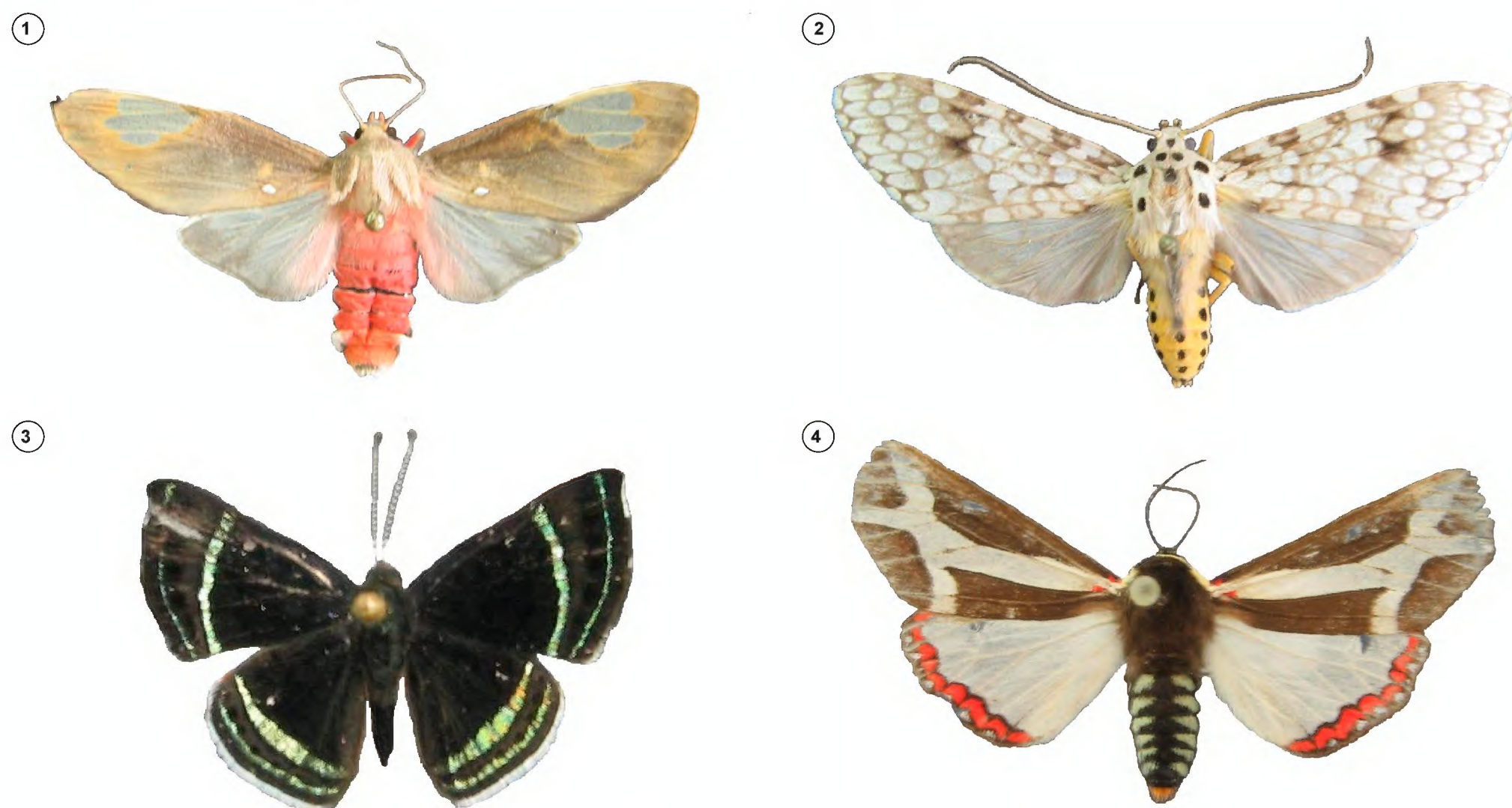
The examination of the previously deposited material in the State's scientific collections resulted in two new records for the *erva-mate* crop: *Nyceryx continua continua* and *Polia marea*, of which the former was also collected during the present study. These two species belong to the MRGC, whose collection is characterized by providing host plant information, which, with rare exceptions, does not occur in other collections. The absence of information in other collections only permitted the occurrence record by locality and season. This indicates the importance of also including biological information for specimens which are deposited in collections. With this information it is possible to assemble precise data banks on species occurrence, pest status, host plant range, and would assist in the detection of long-term environmental and ecological changes.

The final list excluded some taxa from the literature due to identification problems and incongruences. *Biblis hyperia* cited by De Coll and Saini (1992) was excluded because the published image corresponds to the caterpillar of *Adelpha hyas hyas*. *Hylesia paulex* and *H. remex* cited by Borges et al. (2003) were not included, as the record refers only to the presence of adults, captured in light traps, which does not necessarily indicate that their larvae are

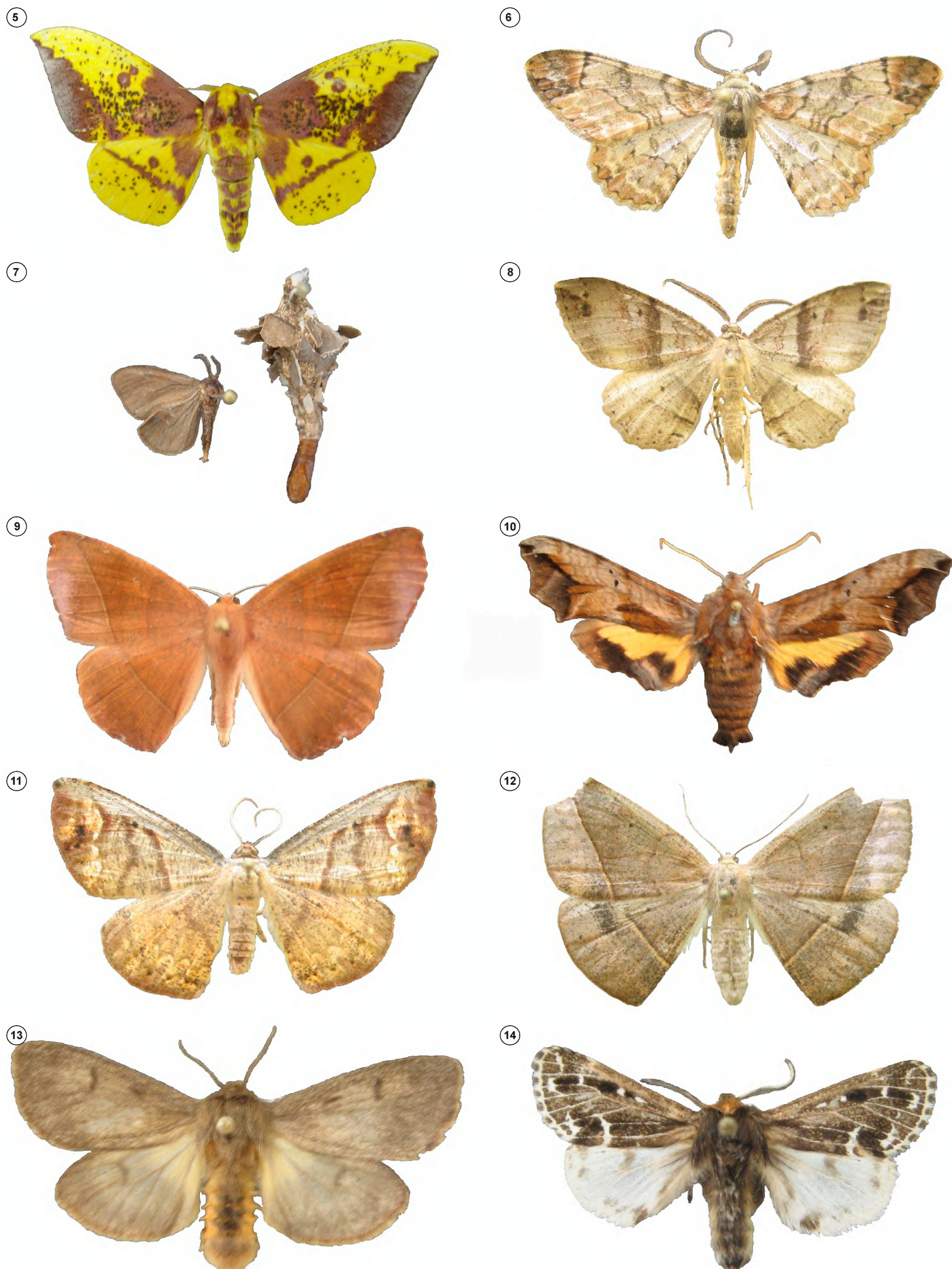
hosted by the crop. Likewise, *H. nanus* was not included because the citation by Santos et al. (1988) was based on Vellozo (1951) who mentions only *Hylesia* sp. without a specific name.

Leucanella memusae registered by Pastrana (2004) was not included because it is a synonym of *L. viridescens*. For the same reason, although previously registered by Silva et al. (1968), this citation should not be considered because it refers to *L. viridescens* cited by Baucke (1960b). Specht et al. (2005) also registered *L. memusae*, taking the name adopted by Silva et al. (1968) into consideration. Furthermore, according to Lemaire (2002), the geographical distribution of *L. memusae* does not include Argentina.

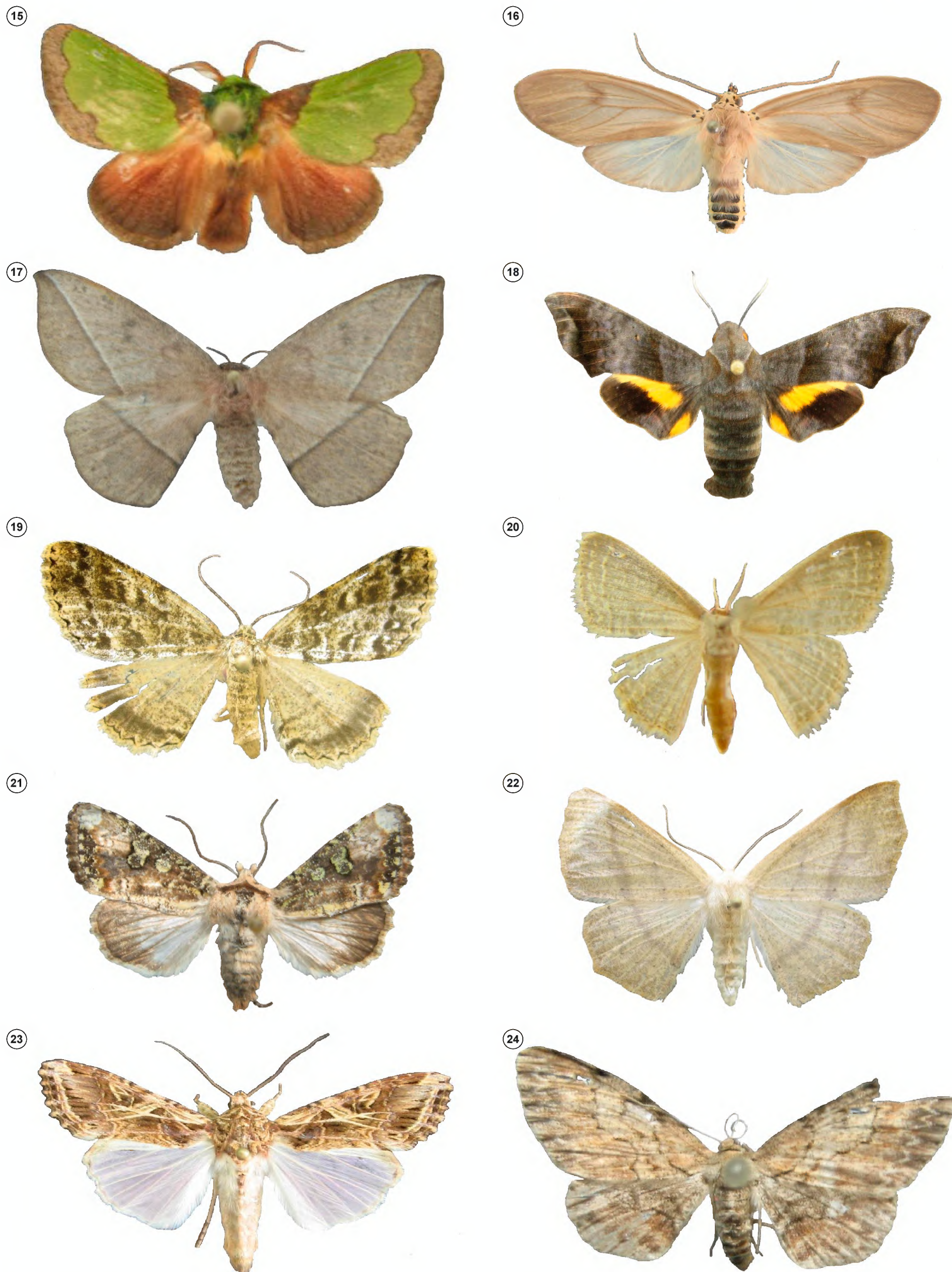
The diversity revealed in this study is well above that which had been registered for this crop (Figure 28), although the majority of the species and subspecies collected are represented by few specimens. This means that greater attention should be given to the Lepidoptera and other insects associated with this crop, in virtue of both their ecological function and management practices. Rapid population growth of many insect species is observed as a result of increases in crop area, the formation of artificially selected genetically similar populations, and the management of native plants into monocultural systems (Andow 1983; 1990; Iede and Machado 1989; Penteado 1995).



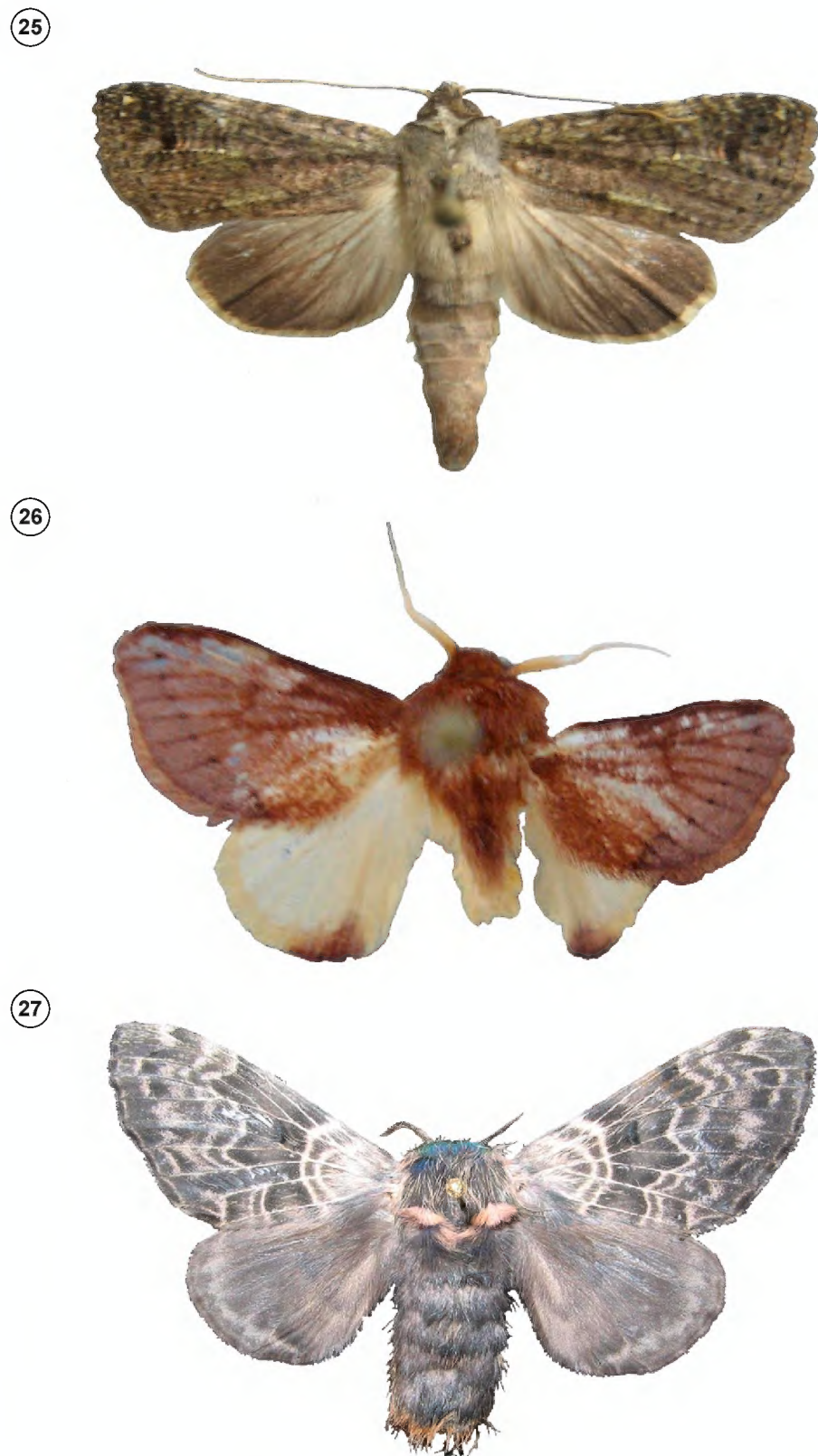
FIGURES 1-4. New records for the *erva-mate* crop: 1- *Bertholdia soror*; 2- *Carales astur*; 3- *Chalodeta theodora*; 4- *Dysschema sacrificia*. Photos: Edegar Fronza.



FIGURES 5-14. New records for the erva-mate crop: 5- *Eacles imperialis magnifica*; 6- *Iridopsis aviceps*; 7- *Lumacra* sp.; 8- *Melanolophia* sp.; 9- *Microgonia perfulvata*; 10- *Nyceryx continua continua*; 11- *Oenoptila mixtata*; 12- *Oxydia sociata*; 13- *Paracles fusca*; 14- *Paracles variegata*. Photos: Edegar Fronza.



FIGURES 15-24. New records for the *erva-mate* crop: 15- *Parasa cucumenica* 16- *Pelochita cinerea*; 17- *Periga circumstans*; 18- *Perigonia passerina*; 19- *Pherotesia subjecta*; 20- *Pleuroprucha asthenaria*; 21- *Polia marea*; 22- *Sabulodes* sp.; 23- *Spodoptera cosmioides*; 24- *Stenalcidia dukinfieldia*. Photos: Edegar Fronza.



FIGURES 25-27. New records for the *erva-mate* crop: 25- *Tachuda pachydexius*; 26- *Talima* sp.; 27- *Titya proxima*. Photos: Edgar Fronza.

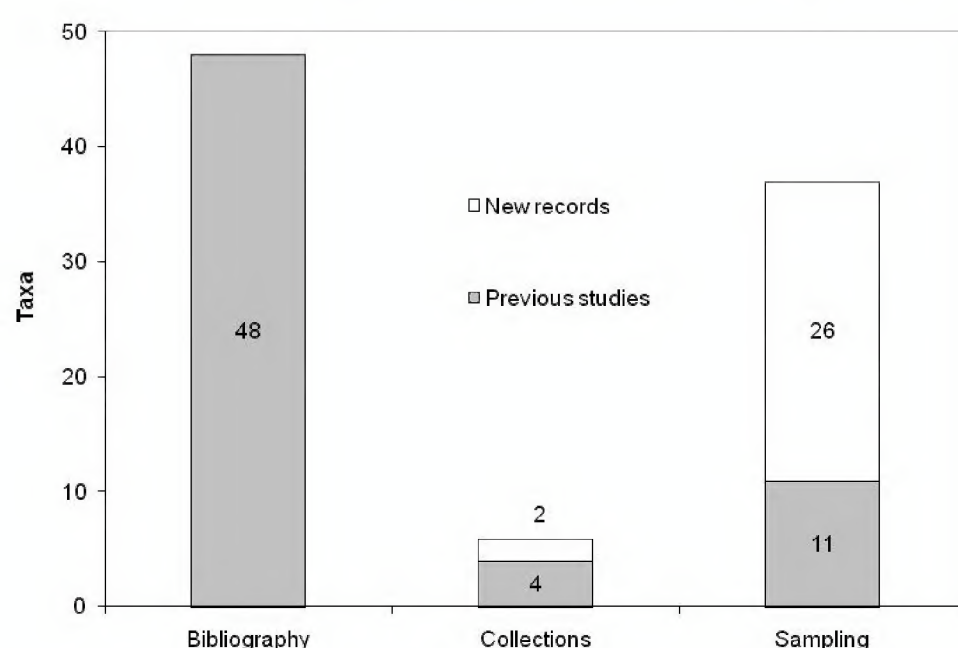


FIGURE 28. Number of Lepidoptera taxa associated with *erva-mate* plants in the State of Rio Grande do Sul, resulting from the bibliographic review, examination of scientific collections and sampling (field collecting in three commercial *erva-mate* farms within the municipality of Anta Gorda, between August 20, 2005 and August 19, 2006, and occasional samples). There is a new record (*Nyceryx continua continua*) both from the collections and the collecting.

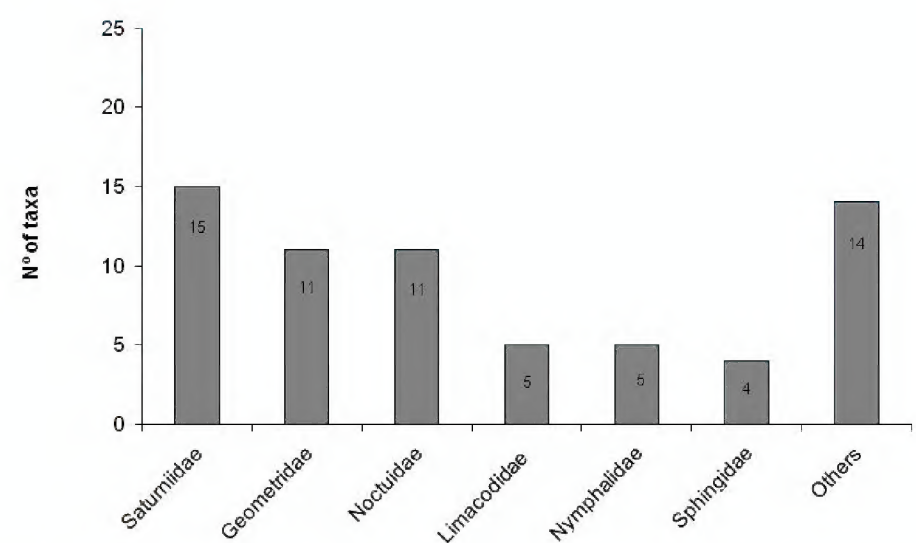


FIGURE 29. Number of Lepidoptera taxa per family occurring on *erva-mate* plants in the state of Rio Grande do Sul.

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